

Comparison of SRTM C-band and X-band DEM over vegetated areas in south Norway

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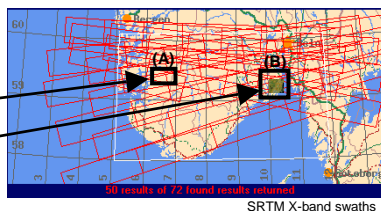
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Øystein Dick, Norwegian University of Life Sciences, Dept. of Mathematical Sciences and Technology

Background

- Data from the SRTM-mission in February 2000
- SRTM covered south Norway up to 60°30' North
- Two test areas: (A) mountainous region in the west
(B) lowland with agriculture, urban, forest in the east
- SRTM C-band (90 m unedited) and X-band (30 m) DEM's
- Reference DEM's based on 1:50 000 and 1:5000 (N5) contour maps



Results from test area B

- Many fine details are resolved in the SRTM DEM's
- The absolute horizontal accuracy is better than 1/5 of a pixel
- The SRTM C- and X-band DEM's are corrected for a vertical offset of +3.3 m and -1.0 m respectively by referring to agricultural fields and the N5 map

- The absolute vertical accuracy over open agricultural fields is much better than specifications:

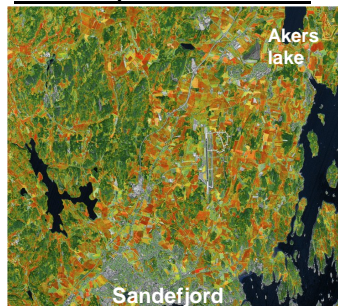
Surface cover type	SRTM absolute vertical accuracy (RMSE) estimated against the 1:5000 (N5) reference map	
	X-band (30 m data)	C-band (90 m unedited data)
Agricultural fields	3.4 m	4.6 m
Dense coniferous forest	9.6 m	9.1 m
All land surface types	5.9 m	6.5 m

For X-band data:

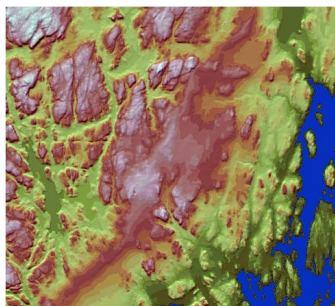
- Agriculture => 95% is within +/- 7 m error
- Dense coniferous forest => 95% is within +/- 16 m error

- The relative vertical accuracy (90 % confidence) is better than 6 m for X-band data and better than 10 m for the C-band unedited data

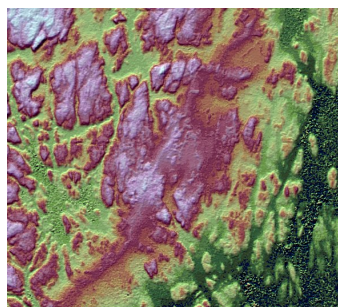
Visual comparison shows many details in the SRTM data sets from parts of test area B



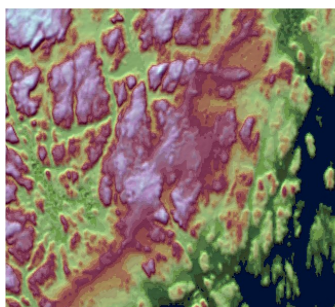
IRS-1C satellite image (© Norwegian Mapping Authority 1998, Antrix, SIE, EUROMAP, OM&M 1997)



Reference DEM based on 1:5000 (N5) contour maps. Colors are given in intervals of 6 m.

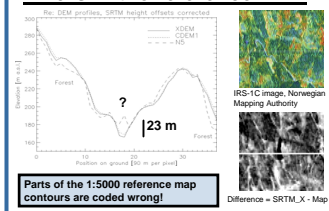


SRTM X-band DEM (30 m data). © DLR 2003.

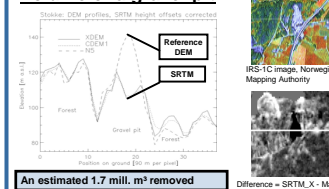


SRTM C-band DEM (90 m unedited data). © NASA/JPL 2004.

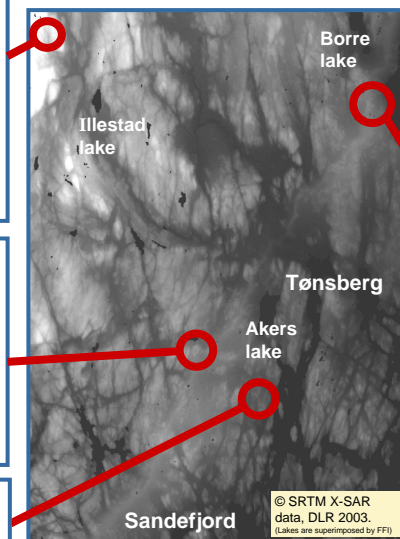
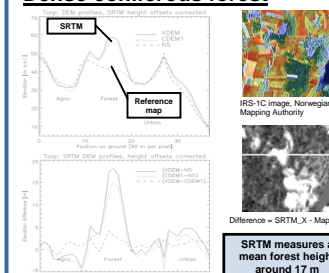
Errors in the reference DEM



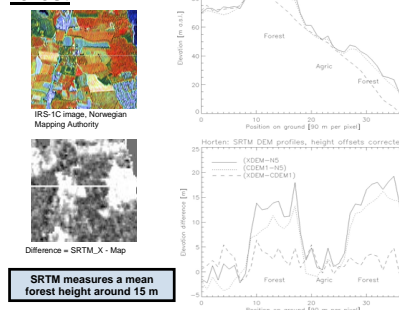
Volume of a gravel-pit



Dense coniferous forest



Dense deciduous forest



Conclusions

- SRTM DEM's have an accuracy in x-, y- and z that is better than specifications
- the SRTM data has a higher accuracy than the 1:50 000 reference map over non-forest areas
- SRTM DEM show reflective surface heights and may therefore be used to estimate tree heights in dense forest stands
- SRTM data may be used to update existing maps